REMARKS

A substitute abstract is attached to this paper. The amendments to the specification correct minor errors. No new matter is believed to be added to the application by this amendment.

Status of the Claims

Claims 1-10 are pending in this application. The amendments to claims 1-4 improve the language of these claims without reducing their scope. Support for claims 5-8 can be found in, e.g., page 6 of the specification. Support for claims 9-10 can be found at, e.g., page 7 of the specification.

Rejection Under 35 USC § 103(a) over Mashino in view of Taniguchi

Claims 1-4 are rejected under 35 USC § 103(a) as being obvious over Mashino (US Patent 5,886,759) in view of Taniguchi (US Patent 6,099,134).

Applicant traverses this rejection and respectfully requests reconsideration and withdrawal thereof.

The Present Invention and its Advantages

The present invention pertains to a display, particularly a liquid crystal display, that has a novel backlight configuration that prevents a bright line without a decrease in brightness. The

invention has at least one lamp and a light guide plate (which can have a dot pattern) for guiding light emitted from the lamp. A diffusing sheet diffuses light emitted from the light guide plate, and at least one prism sheet located on the diffusing sheet concentrates light. A protecting sheet is located on the prism sheet. A reflector is located under the light guide plate so as to reflect light directing downward the light guide plate.

An important aspect of the invention is the utilization of a printing portion made of colorless ink containing a light scattering agent, which can be found on an edge portion of the diffusing sheet adjacent to the lamp, an edge portion of the protecting sheet adjacent to the lamp, or on the reflector. This novel configuration prevents a bright line from forming and additionally has no decrease of brightness.

Distinctions of the Invention over Mashino and Taniguchi

Figures 1-5 of Mashino show a back light system for a liquid crystal display that can be compared to the invention shown in Figures 5-7 of the application. Notably, section 1 shown in Figures 1A and 1B of Mashino is "printed with gray-colored dots, for example, is provided as a hue layer on the undersurface of the end portion 70 of the lamp reflector sheet 66 mounted on the surface of the light guide 37 adjacent to the light receiving face 65." (emphasis added) See Mashino at column 5, lines 58-63.

Further, Mashino at column 4, lines 34-37 (relied upon by the Examiner) states "67 denotes a pattern of a plurality of light diffusion dots printed with white ink on the underside of the light guide 37." (emphasis added) Also, in summarizing the invention, Mashino states "Further, one of gray, dark brown, purple, green and black colors is used for coloring purposes. . . . Further, the color printing to be conducted is in the form of dots." See Mashino at column 2, lines 57-60.

Mashino fails to disclose or suggest "a printing portion made of colorless ink containing a light scattering agent," as is set forth in independent claims 1 and 3 of the invention. That is, Mashino's technology depends upon colored dots, and using a colorless ink (such as in the invention) changes the principle of operation of Mashino.

Despite the failures of Mashino, the Examiner at paragraph 2, line 8, of the Office Action asserts that Mashino teaches "colorless ink". However, there is no teaching or suggestion in Mashino that supports the Examiner's assertion.

However, the Examiner appears to be confused by he difference between the light guide plate 2 and the light scattering layer 3. See Office Action at page 3, line 13 and Taniguchi at column 24, lines 16-17. Further, Taniguchi at columns 11-15 has a detailed discussion of how the dots geometry and arrangement avoid various interference phenomena.

That is, the dots of Taniguchi are formed to make light uniform. In contrast, the printing portion 50 of the present invention is formed to prevent a bright line without a decrease in brightness.

As a result, the technology of Taniguchi is not directed at light scattering, but is rather directed at using the dots for reflection or refraction. In contrast, the present invention eliminates bright line phenomena by using colorless ink containing a light scattering material. That is, Taniguchi (similar to Mashino) also fails to disclose or suggest colorless ink containing a light scattering material.

As has been shown, neither Mashino nor Taniguchi would motivate a person having ordinary skill in the art to produce a claimed embodiment of the invention such as is set forth in independent claims 1 and 3. Thus, a *prima facie* case of obviousness has not been made over claims 1 and 3. Claims dependent upon claims 1 and 3 are patentable for at least the above reasons alone. Accordingly, this rejection is overcome and withdrawal thereof is indicated.

CONCLUSION

Accordingly, in view of the above amendments and remarks, reconsideration and withdrawal of the rejections, and allowance of the claims of the present application are respectfully requested.

Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), the Applicants hereby petition for an extension of one (1) month to September 8, 2002 in which to file a reply to the Office Action. The required fee of $110.00 is enclosed herewith.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
Joseph A. Kolasch, #22,463

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

JAK/GEG/end
3430-0154P

Attachment: Version with Markings to Show Changes Made

(Rev. 02/20/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE ABSTRACT OF THE DISCLOSURE:

The Abstract of the Disclosure has been amended as follows:

[The present invention discloses a] A back light device for [used] use in a liquid [crstal] crystal display device, [including] which includes: at least one lamp; a light guide plate for guiding light emitting from the lamp; a diffusing sheet for diffusing light emitting from the light guide plate; at least one prism sheet located on the diffusing sheet, concentrating light; a protecting sheet located on the prism sheet; and a reflector located under the light guide plate, reflecting light directing downward the light guide plate. At least one of an edge portion of the diffusing sheet adjacent to the lamp, an edge portion of the protecting sheet adjacent to the lamp, and the reflector includes a printing portion made of colorless ink containing a light scattering agent.

IN THE SPECIFICATION:

The paragraph beginning on page 1, line 11, has been amended as follows:

Description of Related Art

Liquid crystal display (LCD) devices are in wide use as display devices capable of [being] having reduced [in] weight, size and thickness. Of these, active matrix LCD devices, in which thin film transistors (TFTs) and pixel electrodes are arranged in the

form of a matrix, have been widely used due to [a] high resolution and [an] excellent performance [of] in implementing moving images.

The paragraph beginning on page 1, line 17, has been amended as follows:

Fig. 1 is a cross-sectional view illustrating a liquid crystal panel of a typical active matrix LCD device. As shown in Fig. 1, the liquid crystal panel 20 includes lower and upper substrates 2 and 4 with a liquid crystal layer 10 interposed therebetween. The lower substrate 2 is divided into two regions: a region S; and a region P. TFTs are arranged on the region S as a switching element, and pixel electrodes 14 are arranged on the pixel region P. The upper substrate 4 includes a color filter 8 and a common electrode 12. Through the pixel electrode 14 and the common electrode 12, voltages are applied to the liquid crystal layer 10. In order to prevent a leakage of the liquid crystal, edge portions of the two substrate 2 and 4 are sealed by a sealant 6. The TFT receives signals from an external drive integrated circuit (IC) to drive the pixel electrode 14.

The paragraph beginning on page 2, line 9, has been amended as follows:

However, part of light generated from the back light device 30 is reflected from an edge portion "A" of a bottom surface of the

liquid crystal panel 20, and reflected light causes a constructive interference along with light generated from the back light device. As a result, a portion "B" of the back light device 30 is relatively stronger in brightness than other portions around the portion "B", whereby a bright line occurs along a dot line on an active area, i.e., a screen. In general, a bright line may occur even when a gap between a lamp housing and a light guide plate does not exist. This is the result [that] of light that directs inward from the light guide plate does not conduct a total reflection and does not form [an] a uniform light distribution before emitting from the light guide plate.

The paragraph beginning on page 2, line 19, has been amended as follows:

In order to prevent a bright [light] line, several conventional solutions have been introduced. Fig. 3 shows one of conventional solutions to prevent a bright [light] line. As shown in Fig. 3, a black pad 40 is formed along an edge portion of the top surface of the back light device 30. However, such a solution is very difficult [in working] to work. In addition, when an assembly error occurs between the liquid crystal panel 20 and either of the back light device 30 and the black pad 40, [inferiority] inferiorities result such as a bright line, a light leakage, and a covering of an edge portion of an active area. For

example, when the black pad 40a is located outside a proper location, a bright line occurs along a dot line. Further, when the black pad 40b is located inside a proper location, the black pad 40b covers an active area.

The paragraph beginning on page 3, line 5, has been amended as follows:

Fig. 4 shows another solution to prevent a bright line according to the conventional art. As shown in Fig. 4, the back light device includes a lamp 31 as a light source. A lamp housing 39 surrounds most [part] of the lamp 31. A lamp reflector 32 is located inside of the lamp housing 39. A light guide plate 33 is located adjacent to the lamp 31. Light emitted from the lamp 31 directs toward the liquid crystal panel (not shown) through the light guide plate 33. The light guide plate 33 has a plurality of patterns 33a (for example, a dot pattern) on its bottom surface. The patterns 33a are formed by a printing, a V-cut, [a] molding or the like. A plurality of sheets are stacked on the light guide plate 33: a diffusing sheet 35; two prism sheets 36 and 37; and a protecting sheet 38. A reflector 34 is located under the light guide plate 33. On the reflector 34, a printing portion 34a is formed to prevent a bright line that comes from light incident to an upper or a lower surface of the light guide plate 33 other than an emitting portion of the light guide plate 34. The printing

portion 34a is colored by mixing colors and a certain pattern of a gray scale.

The paragraph beginning on page 3, line 19, has been amended as follows:

However, the printing portion 34a of the reflector 34 may lower [a] the brightness. Further, a brightness deviation may occur due to a variation of a printing portion size and an ink color, an assembly error, and a fluctuation of the reflector.

The paragraph beginning on page 4, line 5, has been amended as follows:

In order to achieve the above object, the preferred embodiments of the present invention provide a back light device for used in a liquid [crstal] crystal display device, including: at least one lamp; a light guide plate for guiding light emitting from the lamp; a diffusing sheet for diffusing light emitting from the light guide plate; at least one prism sheet located on the diffusing sheet, concentrating light; a protecting sheet located on the prism sheet; a reflector located under the light guide plate, reflecting light directing downward from the light guide plate, wherein at least one of an edge portion of the diffusing sheet adjacent to the lamp, an edge portion of the protecting sheet

adjacent to the lamp, and the reflector includes a printing portion made of colorless ink containing a light scattering agent.

The paragraph beginning on page 5, line 3, has been amended as follows:

[The lamp is two in number] There are two lamps.

The paragraph beginning on page 5, line 6, has been amended as follows:

Fig. 4 shows another [solutions] solution to prevent a bright light according to the conventional art;

The paragraph beginning on page 6, line 8, has been amended as follows:

Fig. 5 is a schematic view illustrating a back light device for use in a transmissive liquid crystal display (LCD) device according to a first preferred embodiment of the present invention. As shown in Fig. 5, the back light device includes a lamp 31 as a light source. At this point, in the case of large-sized LCD devices, at [lease] least two lamps may be arranged. A lamp housing 39 surrounds most part of the lamp 31. A lamp reflector 32 is located inside of the lamp housing 39. A light guide plate 33 is located adjacent to the lamp 31. Light emitted from the lamp 31 directs toward the liquid crystal panel (not shown) through the

light guide plate 33. The light guide plate 33 has a plurality of patterns 33a (for example, a dot pattern) on its bottom surface. The patterns 33a are formed by a printing, a V-cut, [a] molding or the like. A plurality of sheets are stacked on the light guide plate 33: a diffusing sheet 35; two prism sheets 36 and 37; and a protecting sheet 38. A reflector 34 is located under the light guide plate 33. A printing portion 50 is formed on a surface of the reflector 34.

The paragraph beginning on page 6, line 21, has been amended as follows:

The printing portion [34a] 50 is made of colorless ink containing a light scattering agent. As a result, light reflected from the reflector 34 is scattered, thereby preventing light from being concentrated at a certain portion. Therefore, a bright line is prevented, leading to a high brightness.

The paragraph beginning on page 7, line 2, has been amended as follows:

Fig. 6 is a schematic view illustrating a back light device for use in a transmissive LCD device according to a second preferred embodiment of the present invention. As shown in Fig. 6, the back light device includes a lamp 31 as a light source. At this point, in the case of large-sized LCD devices, at [lease] least two

lamps may be arranged. A lamp housing 39 surrounds most part of the lamp 31. A lamp reflector 32 is located inside of the lamp housing 39. A light guide plate 33 is located adjacent to the lamp 31. Light emitted from the lamp 31 directs toward the liquid crystal panel (not shown) through the light guide plate 33. The light guide plate 33 has a plurality of patterns 33a (for example, a dot pattern) on its bottom surface. The patterns 33a are formed by a printing, a V-cut, [a] molding or the like. A plurality of sheets are stacked on the light guide plate 33: a diffusing sheet 35; two prism sheets 36 and 37; and a protecting sheet 38. A reflector 34 is located under the light guide plate 33.

The paragraph beginning on page 7, line 14, has been amended as follows:

At this time, the diffusing sheet 35 includes a printing portion 50 at its edge portion adjacent to the lamp 31. The printing portion 50 is made of colorless ink containing a light scattering agent. As a result, even thought light reflected from a bottom surface of the liquid crystal panel (not shown) causes a constructive interference together with light emitting from the lamp 31, light is scattered due to the printing portion 50 so that light is not concentrated at a certain portion, thereby preventing a bright line. Further, [a] brightness is improved.

The paragraph beginning on page 7, line 21, with the following rewritten paragraph:

Fig. 7 is a schematic view illustrating a back light device for use in a transmissive LCD device according to a third preferred embodiment of the present invention. As shown in Fig. 7, the back light device includes a lamp 31 as a light source. At this point, in case of large-sized LCD devices, at lease two lamps may be arranged. A lamp housing 39 surrounds most part of the lamp 31. A lamp reflector 32 is located inside of the lamp housing 39. A light guide plate 33 is located adjacent to the lamp 31. Light emitted from the lamp 31 directs toward the liquid crystal panel (not shown) through the light guide plate 33. The light guide plate 33 has a plurality of patterns 33a (for example, a dot pattern) on its bottom surface. The patterns 33a are formed by a printing, a V-cut, [a] molding or the like. A plurality of sheets are stacked on the light guide plate 33: a diffusing sheet 35; two prism sheets 36 and 37; and a protecting sheet 38. A reflector 34 is located under the light guide plate 33.

The paragraph beginning on page 8, line 18, has been amended as follows:

As described herein before, using the back light device for use in the [transmissivve] <u>transmissive</u> LCD device according to the

present invention, a bright line is prevented, thereby improving a brightness.

IN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A back light device for [used] use in a liquid [crstal] crystal display device, comprising:

at least one lamp;

a light guide plate for guiding light emitting from the lamp;

a diffusing sheet for diffusing light emitting from the light guide plate;

at least one prism sheet located on the diffusing sheet, concentrating light;

a protecting sheet located on the prism sheet;

a reflector located under the light guide plate, reflecting light directing downward the light guide plate,

wherein at least one of an edge portion of the diffusing sheet adjacent to the lamp, an edge portion of the protecting sheet adjacent to the lamp, [and] or the reflector includes a printing portion made of colorless ink containing a light scattering agent.

2. (Amended) The back light device of claim 1, wherein [the lamp is two in number] there are two lamps.

3. (Amended) A liquid crystal display device, comprising:

a liquid crystal panel including two substrates with a liquid crystal layer interposed therebetween;

a back light device including:

a) at least one lamp;

b) a light guide plate for guiding light emitting from the lamp;

c) a diffusing sheet for diffusing light emitting from the light guide plate;

d) at least one prism sheet located on the diffusing sheet, concentrating light;

e) a protecting sheet located on the prism sheet;

f) a reflector located under the light guide plate, reflecting light directing downward the light guide plate,

wherein at least one of an edge portion of the diffusing sheet adjacent to the lamp, an edge portion of the protecting sheet adjacent to the lamp, [and] or the reflector includes a printing portion made of colorless ink containing a light scattering agent.

4. (Amended) The [back light] display device of claim 3, wherein [the lamp is two in number] there are two lamps.

Claims 5-10 have been added.